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The 3E Machinery lithium battery recycling system is an advanced, fully integrated technological solution designed for the safe, efficient, and environmentally responsible processing of spent lithium batteries and electrode materials. The line combines state-of-the-art crushing, separation, thermal treatment, and industrial automation technologies, enabling the recovery of valuable raw materials while maintaining the highest safety standards.



Comprehensive Resource Recovery Technology

The recycling process utilizes a series of physical and thermal operations, including :

- multi-stage crushing,
- gravity and air separation,
- precision screening,



- drying and low-temperature pyrolysis,
- exhaust gas purification,
- central dust removal and fully sealed material conveying.

Depending on the selected process configuration, the system enables the recovery of key fractions such as copper, aluminum, separator film, black mass, electrolyte, and additional components.

Key System Features

1. Safe and Controlled Crushing

- Specialized, patented shredders and crushers designed specifically for lithium batteries.
- Capable of processing charged batteries thanks to gas-protection technology and multi-level fire-prevention systems.
- A three-stage crushing process ensures optimal material liberation.

2. High-Efficiency Material Separation

- Air separation system with efficiency up to 99% for separating light and heavy fractions.
- Combined static and dynamic screening for optimal recovery of black mass.
- Precise gravity separation of copper and aluminum granules.

3. Thermal Processing – Drying and Pyrolysis

- Drying at 100–150°C with the possibility of recovering condensed electrolyte; separator films remain intact for further processing.
- Low-temperature pyrolysis at 450–600°C effectively removes organic matter and improves the quality of recovered black mass.
- Advanced exhaust treatment system utilizing catalytic oxidation, alkaline scrubbing, and activated carbon filtration to meet emission standards.



4. Full Automation and Operational Safety

- Central control system based on Siemens PLC, compatible with MODBUS TCP/IP, PROFINET, and OPC.
- Modular design ensures flexibility, easy maintenance, and scalable system configuration.
- Fully enclosed conveying and central dust-removal systems maintain a clean and safe working environment.

System Capacity and Technical Scope :

- Processing capacity: 500 to 20,000 tons per year
- Installed power: 150–1280 kW

Applications:

- spent EV and industrial batteries,
- consumer lithium-ion batteries (3C),
- positive and negative electrode sheets,
- modules, cells, and production scrap.

Layout: custom-designed according to client facility requirements.

Optional Extensions :

- 3E Machinery also offers complementary systems, including:
- battery pack dismantling lines,
- separator film cleaning and recycling lines,
- black mass refining and purification systems,
- aluminum and steel component recycling solutions.

Why Choose 3E Machinery Technology?

- Over 20 years of expertise in recycling technologies.



- Proprietary patented equipment, including lithium battery crushers and shredders.
- High level of automation and advanced process safety.
- Global references with numerous installations across Europe and Asia.
- Comprehensive support from design to commissioning and after-sales service.

